PROCESS IMPROVEMENTS TO INCREASE POLYSTYRENE DIVERSION/RECYCLING CAPACITY

FINAL REPORT

INDUSTRIAL WASTE DIVERSION PROGRAM

JULY 1997

Ontario

Ministry of
Environment
and Energy

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Report prepared by:

Canadian Polystyrene Recycling Association
June 1997

Report prepared for:

Ontario Ministry of Environment and Energy

TABLE OF CONTENTS

		Page
1.	Executive Summary	1
2.	Introduction	2
	♦ Purpose of report	
	♦ Summary of 1994 Submissions	
3.	The Mississauga Facility	
	a. Feedstock Collection	
	i. Food Service Materials	6
	ii. Blue Box	6
	iii. Industrial, Expanded Polystyrene (EPS) Rigid Polystyrene	7
	iv. Waste Diversion	8
	b. Process Operations	9
	c. New Process Equipment	
	i. Phase 1	9
	ii. Phase 2	9
	iii. Phase 3	10
4.	Marketing	
	i. Sales Agreements	11
	ii. Markets	11

Page

5. Conclusions 12

Appendixes

Appendix A - Current CPRA Member Companies
Appendix B - Premiers Letter

Tables

Table 1 - MOEE Capital Funding
Table 2 - Municipal Polystyrene, Generation Rates - 1996
Table 3 - Rigid Feedstock Distribution Gross Receipts
Table 4 - Polystyrene Waste Diversion
Table 5 - Industrial Process Flow

1.0 EXECUTIVE SUMMARY

The Canadian Polystyrene Recycling Association provides a state of the art polystyrene recycling capability for all types of polystyrene produced and used in the Canadian market. The plant is approximately 80,000 square feet, and contains processing equipment capable of sorting, granulating, washing, drying extruding and pelletizing both contaminated food service polystyrene containers and clean, dry, polystyrene cushion and rigid packaging and containers. Total annual processing capacity is approximately 5,000 tonnes.

The plant commenced operations in August 1991. The initial two years of operation involved an evaluation of the Mississauga plant's processing capabilities and an analysis of existing and future market demand for reprocessed, resin resulted in a three-phased capital expansion and upgrading program for the Mississauga plant, totalling an estimated $790,000. This would provide improved through-put capability, and increase the plant's capacity for handling a wide range of polystyrene plastic products.

The Ministry of Environment and Energy awarded a grant of up to $76,870 to assist in financing the facility upgrades.

This report reviews the operations of the Mississauga facility.

2.0 INTRODUCTION

The Canadian Polystyrene Recycling Association (CPRA) is a non-profit corporation, established in 1989 by letter patent under the provisions of Part II of the Canada Corporations Act. The objectives of the corporation are to undertake the establishment, operation and development of facilities for the recycling of products manufactured from polystyrene plastics; to undertake studies and research concerning polystyrene recycling; and to promote consumer participation in polystyrene recycling by all means available.

Membership in the Association consists of those persons or corporations, associations, partnerships or other organizations interested in furthering the objectives of the corporation. Applications for admission as a member must receive approval of the Board of Directors of the corporation. A complete list of present members of the Association is contained in Appendix A.

In February 1994, CPRA submitted a proposal to the Ontario Ministry of Environment and Energy, requesting funding assistance under the Ministry's Industrial Waste Diversion Program for capital improvements to increase the capacity of its Mississauga plant.

In March 1994, CPRA signed an agreement with the Ministry of Environment and Energy whereby the Ministry agreed to pay a grant to CPRA of up to $76,870.00 covering eligible capital and installation costs.

Purpose of this Report

The purpose of this document is to provide a final report documenting the progress of the Mississauga plant, and the results and conclusions that can be presented to the Ministry at this time.

Purpose of the Project

The project was intended to:

- Increase the waste diversion capability of the Mississauga plant.
- Improve the plant's capability of diverting a wide range of polystyrene plastics from the waste stream.
- Improve the marketability of recycled plastic resin produced at the Mississauga plant.
- Reduce and eventually eliminate operating losses.

The costs, the total amount of financial assistance requested based on the estimated costs and the Ministry's contribution to date are summarized in Table 1.

The purpose of CPRA's Mississauga facility is to provide a state-of-the-art polystyrene recycling capability for all types of polystyrene produced and used in the Canadian market. The plant is approximately 80,000 square feet, and contains processing equipment capable of sorting, granulating, washing, drying, extruding and pelletizing both contaminated food-service polystyrene containers, and clean, dry, polystyrene cushion, rigid packaging and containers.

TABLE 1
CANADIAN POLYSTYRENE RECYCLING ASSOCIATION
MOEE CAPITAL FUNDING - MISSISSAUGA PLANT

ELIGIBLE EQUIPMENT	ORIGINAL ESTIMATE	ACTUAL COST	MOEE GRANT MAXIMUM	MOE PAYMENT	REMAINING BALANCE
PHASE I					
Blending Silos and Air Conveyors	$97,000.00	$97,750.00	$9,700.00	$58.00	$9,642.00
Installation	$37,000.00	$30,992.00	$3,700.00	$3,099.00	$601.00
Engineering	$26,000.00	$13,217.00	$2,600.00	$1,322.00	$1,278.00
PHASE II					
Industrial Conveyors	$87,000.00	$51,723.00	$8,700.00	$5,172.00	$3,528.00
Magnets	$8,000.00	$7,530.00	$800.00	$753.00	$47.00
Float/Sink Tank	$19,000.00	$22,565.00	$1,900.00	$1,900.00	$0.00
Dryers (2)	$39,000.00	$28,108.00	$3,900.00	$2,811.00	$1089.00
Screener	$15,000.00	$14,996.00	$1,500.00	$1,500.00	$0.00
Air Conveyor	$13,500.00	$15,192.00	$1,350.00	$1,350.00	$0.00
EPS Size Reduction	$15,000.00	$13,540.00	$1,500.00	$1,354.00	$146.00
Loading Pit	$20,000.00	$18,983.00	$2,000.00	$1,898.00	$102.00
Electrical Installation	$57,000.00	$48,733.00	$5,700.00	$4,873.00	$827.00
Piping Installation	$5,000.00	$3,952.00	$500.00	$395.00	$105.00
Misc. Equipment Installation	$37,500.00	$24,319.00	$3,750.00	$2,432.00	$1,318.00
Engineering	$19,000.00	$8,904.00	$1,900.00	$890.00	$1,010.00

TABLE 1 *(continued)*

PHASE III					
ELIGIBLE EQUIPMENT	**ORIGINAL ESTIMATE**	**ACTUAL COST**	**MOEE GRANT MAXIMUM**	**MOE PAYMENT**	**REMAINING BALANCE**
Grinder	$65,000.00	$71,810.00	$6,500.00	$6,500.00	$0.00
Additive Feeders and Misc. Auxiliary Equipment	$154,430.00	$94,626.00	$15,443.00	$9,462.00	$5,981.00
Engineering	$20,275.00	$11,153.34	$2,027.00	$1,043.54	$1,383.46
Electrical Installation	$15,000.00		$1,500.00	$446.00	$1,054.00
Mechanical Installation	$15,000.00		$1,500.00	$1,500.00	$0.00
Piping	$4,000.00		$400.00	$400.00	$0.00

3.0 MISSISSAUGA FACILITY

a) Feedstock Collection

i. Food Service Materials

CPRA processes disposable polystyrene food service products, including such items as cups, plates, clam shell containers, and cutlery.

These materials are collected at source by a number of private waste management companies, and delivered to CPRA for sorting, washing and reprocessing.

Food service collection sites encompass a wide range of generators across Southern Ontario. The distribution of sources is as detailed below:

- Manufacturing and assembly operations 30%
- Private sector office buildings 23%
- Health care 13%
- Educational institutions 12%
- Provincial government buildings 10%
- Retail Operations 8%
- Federal government buildings 4%

ii. Blue Box

CPRA has fostered the inclusion of polystyrene in the curbside collection programmes of a significant number of Ontario households.

An active community outreach campaign aimed at raising awareness of the recyclability of polystyrene has been developed by CPRA in support of the municipal collection efforts.

Ontario municipalities providing curbside collection of polystyrene are listed in Table 2.

In addition, Toronto accepts polystyrene at two of its public access depots.

TABLE 2
MUNICIPAL POLYSTYRENE GENERATION RATES - 1996
(DATA FROM OMMRI)

ONTARIO REGIONS	TOTAL NUMBER OF HOUSEHOLDS
OTTAWA/CARLETON	250,489
PEEL REGION	243,548
NIAGARA REGION	145,000
HALTON REGION	113,408
PETERBOROUGH	71,210
QUINTE	62,980
GREATER KINGSTON	54,552
HALDIMAND NORFOLK	36,000
NORTHUMBERLAND	35,000
MUSKOKA & HALIBURTON	34,445
RENFREW	34,172
TOTAL	1,080,804

Polystyrene collected through the blue box system is sorted and baled by the municipality, or its contractor, and delivered to CPRA for subsequent processing.

In 1996 CPRA expects to collect in excess of 140 tonnes of material from Ontario households.

iii. Industrial
Expanded Polystyrene (EPS)

CPRA provides an outlet for manufacturers and retailers to recycle EPS cushion packaging. Moulded blocks, loose filled packaging (peanuts) and other forms of EPS are delivered to the plant by generator of the material, or by one of a number of commercial waste management companies offering this service to their customers.

iv. Rigid Polystyrene

Rigid polystyrene represents a major source of feedstock for the Mississauga plant. This material is generated from various industry sources detailed in Table 3.

TABLE 3
RIGID FEEDSTOCK DISTRIBUTION
GROSS RECEIPTS

SOURCE INDUSTRY	PERCENT OF TOTAL RIGID FEEDSTOCK RECEIVED
AUDIO/VIDEO RECORDING	9.7
RETAIL OPERATION	36.2
AGRICULTURAL	11.9
ELECTRIC/PHOTOGRAPHIC	6.5
ADVERTISING	9.2
OFFICE EQUIPMENT	10.8
MISCELLANEOUS	15.7
	*JAN-AUG 1996

v. Waste Diversion

CPRA has, since start up of its plant in 1991, steadily increased both its total volume and range of polystyrene waste diverted from landfill, or other disposal.

Total quantities of material processed are shown in Table 4.

TABLE 4
POLYSTYRENE WASTE DIVERSION

YEAR	TOTAL MATERIAL PROCESSED (METRIC TONNES)
1991	145
1992	900
1993	1600
1994	1762
1995	2621

b) Process Operations

To establish the facility, CPRA had invested more than $2,250,000.00 in engineering, equipment and installation for recycling polystyrene.

The installed equipment provided CPRA with the capacity to recycle foodservice disposable items, municipal curbside material, expanded polystyrene (foam) packaging, and rigid (non foamed) packaging and components.

Experience gained in the first two years of operation demonstrated that economic goals would not be realized without implementing improvements in the processing of industrial (EPS and rigid) material. The original and proposed process flows are shown in Table 5.

Additional equipment was required to remove material handling bottlenecks, effectively remove contaminants from a wide range of feedstock and provide capacity to blend finished products in large homogeneous lots.

c) New Process Equipment

i. Phase 1

The first phase of the program involved the installation of two blending silos, each with a capacity of 10 tonnes of recycled polystyrene pellets, and pneumatic conveying equipment to load and unload the silos.

The pellets are blended in the silos to create a consistent, homogeneous batch of polystyrene resin.

This capability has resulted in a superior product for subsequent fabrication operations.

ii. Phase 2

The second phase of the plant upgrade was designed to achieve three objectives:

1) To improve material handling ergonomics.

A conveying system was installed in a floor pit to eliminate the need to manually pick material from the floor to place it into the grinding process.

Additional size reduction equipment was installed to eliminate the need for manual reduction of large EPS blocks.

2) To clean contaminants from the feedstock, in-line magnets were installed to remove ferrous metal particles from the product prior to extrusion. A mechanical screener was provided to remove other fine particulate contamination.

3) To separate polystyrene from polyolefins.

Polystyrene materials diverted from agricultural and retail sources frequently contain look alike items made from polyolefins. The process improvements allow for these materials to be air conveyed to a water filled float/sink tank where they are separated by virtue of the differential specific gravity of the resins.

Each resin stream is then passed through a dryer to remove the surface moisture prior to further processing.

This capability allows CPRA to accept waste materials that are too highly cross contaminated for most traditional processes.

iii. Phase 3

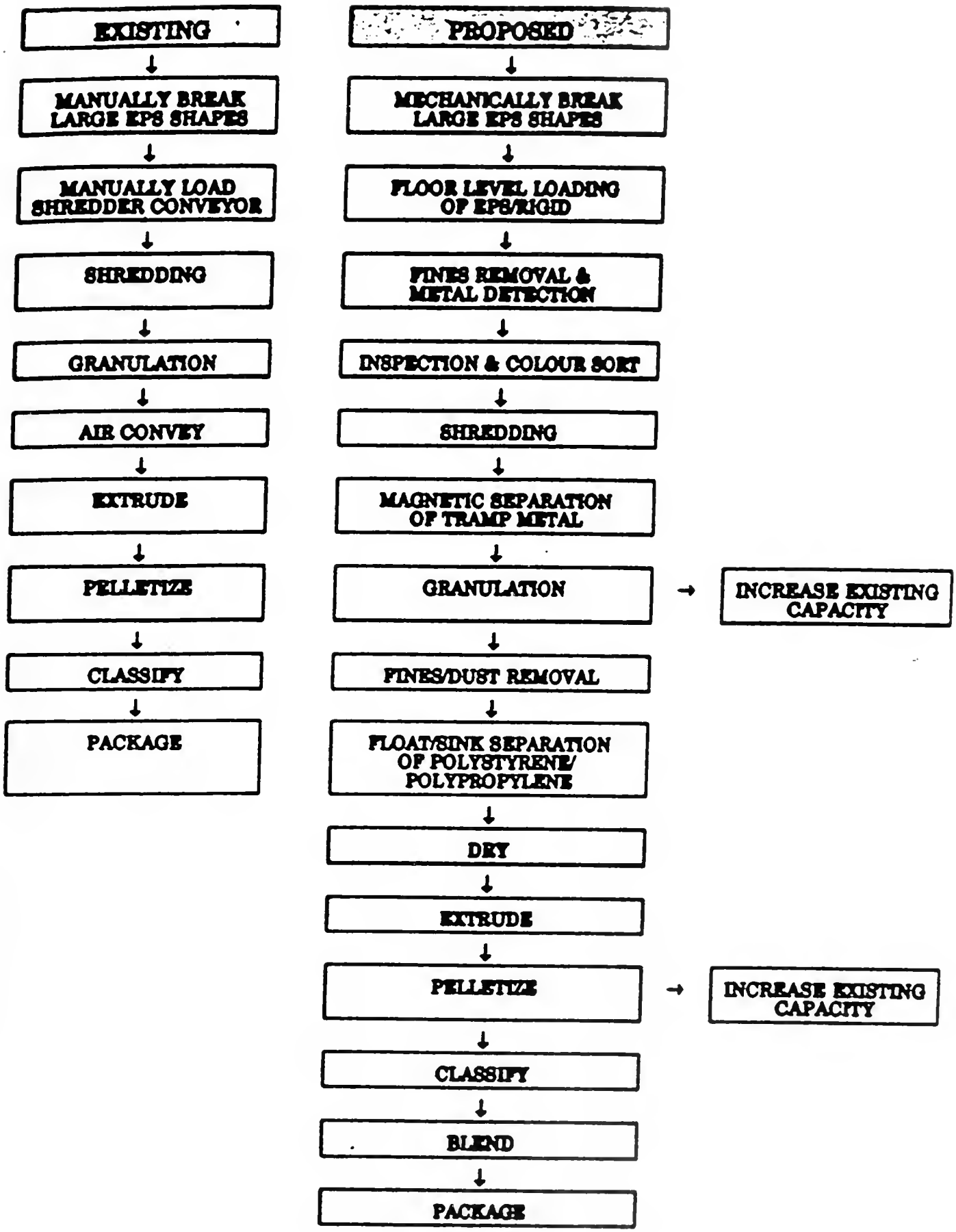
The third phase of the project was intended to accomplish two main objectives:

1) The installation of a larger grinder improved the capacity of the plant, allowed the acceptance of larger waste components, and reduced grinding labour costs.

2) The additive feeder/blender and associated auxiliary equipment give CPRA the capability to produce recycled resins engineered to meet specific customer material requirements.

TABLE 5

INDUSTRIAL PROCESS FLOW



4.0 MARKETING

I) Sales Agreements

At the time this project was initiated, CPRA sold finished products through two exclusive sales agents; Dow Chemical Canada Inc, and NOVA Chemicals Ltd.

Through this arrangement the expert market development, sales and technical support of two of Canada's foremost petrochemical suppliers were focused on the development of sustainable markets for CPRA's product line.

Recent changes to the agreements, and the creation of new staff positions, have allowed CPRA to assume direct responsibility for all sales and marketing.

ii) Markets

CPRA produces a range of custom formulated materials that are sold to various injection moulding, sheet and profile extrusion companies.

The recycled resins are used to manufacture such items as:

- office accessories
- houseware and hardware items
- appliance parts
- construction materials
- horticultural products
- business machine parts

5.0 CONCLUSIONS

The project had four key objectives:

1) Increase the waste diversion capability of the Mississauga plant.

Outcome: This has been successfully accomplished as demonstrated in Table 4, on page 8. Continued growth is expected as new and larger markets for finished products are developed.

2) Improve the plant's capability of diverting a wide range of polystyrene plastics from the waste stream.

Outcome: Recycling opportunities beyond those anticipated in the retail and electronic photographic industries have been identified and realized.

Substantial quantities of material have been sourced from the horticultural and audio/video recording industries.

3) Improve the marketability of recycled plastic resin produced at the Mississauga plant.

Outcome: The objective has been met, with sales volume increasing from a total of 290 tonnes at the time of approval of this project, to current annual rate in excess of 2,500 tonnes.

4) Reduce and eventually eliminate operating losses.

Outcome: CPRA has not yet reached a sales volume level that eliminates operating subsidies from its member companies. However, losses in 1995 fiscal year were less than 2.5% of sales. It is anticipated that the subsidy can be eliminated with the projected growth in resin sales.

CPRA ARPC

Canadian Polystyrene Recycling Association
7595 Tranmere Drive
Mississauga, Ontario
L5S 1L4

Association de recyclage du polystyrène du Canada
Tel: (905) 612-8290
Fax (905) 612-8024

1997 CPRA MEMBERS

Adelco Supply Co. Inc.

Balpex Inc.

Beaver Foods Ltd.

The Becker Milk Co. Ltd

Canada Catering Co. Ltd.

Chester Plastics Ltd.

Dairy Queen Canada Inc.

Dana Hospitality Inc.

Dart Cup Ltd.

Dow Chemical Canada Inc.

Environment and Plastics Industry Council

Foseco-Morval Inc.

Ivex Packaging Corporation

James River Canada Inc.

Lily Cups Inc.

MCC Industrial Services Ltd.

M&R Plastics Inc.

NOVA Chemicals Ltd.

Ontario Hydro

Par-Pak Ltd.

Polar Plastic Ltd.

Polystyrene Packaging Council

Shell Canada Chemical Company

Styro-Patterns Inc.

Versa Services Limited

Ontario

The Premier of Ontario
Le Premier ministre de l'Ontario

Legislative Building
Queen's Park
Toronto, Ontario
M7A 1A1

Hôtel du gouvernement
Queen's Park
Toronto (Ontario)
M7A 1A1

April 18, 1996

Mr. Michael Scott
President
Canadian Polystyrene Recycling Association
7595 Tranmere Drive
Mississauga, Ontario
L5S 1L4

Dear Mr. Scott:

Since being given a mandate by Ontario citizens to deliver practical, common sense solutions to the challenges facing our province, our Government has had to make some tough decisions. This is also true for most businesses operating today.

I'm confident, however, that we have the talent here in Ontario to meet these challenges, and I applaud the Canadian Polystyrene Recycling Association (CPRA), and each of its member companies, for staying the course. Your association's work is valuable and plays an important role in helping to maintain a healthy environment.

Initiatives such as product stewardship show the vision and innovative spirit necessary in the environmental field to achieve our government's goal of an economically and environmentally healthy Ontario. I encourage each member of CPRA to keep up the good work. Private sector recycling operations which are also financially self-sustaining, are good for business — and that's good for Ontario.

... 2

On behalf of the Government of Ontario, congratulations on your association's success

Sincerely,

Michael D. Harris, MPP

c: Adelco Supply Co. Inc., Glenford Paper Division
Balpex Inc.
Beaver Foods Limited
The Becker Milk Company Limited
Chester Plastics Ltd.
Dairy Queen Canada Inc.
Dana Hospitality Inc.
Dart Cup Ltd.
Dow Chemical Canada Inc.,
Rubbermaid Office Products
Enivronment and Plastics Institute of Canada
Ivex Packaging Corporation
James River Canada Inc.
Lily Cups Inc.
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